

Quantifying Natural Gas Abatement from Bundled Blowdowns

Pacific Gas and Electric Company





Agenda

- **Background**
- **Example**
- **Methodology**
- **Conclusion**

Best Practice 7

Requires a Bundling Work Policy:

- Written company policy requiring bundling of work, whenever practicable
- Prevent multiple venting of the same piping consistent with safe operations

Challenge quantifying the amount of natural gas abated from project/clearance bundling

- Would require project teams to develop clearance plans for each of the individual project blowdowns

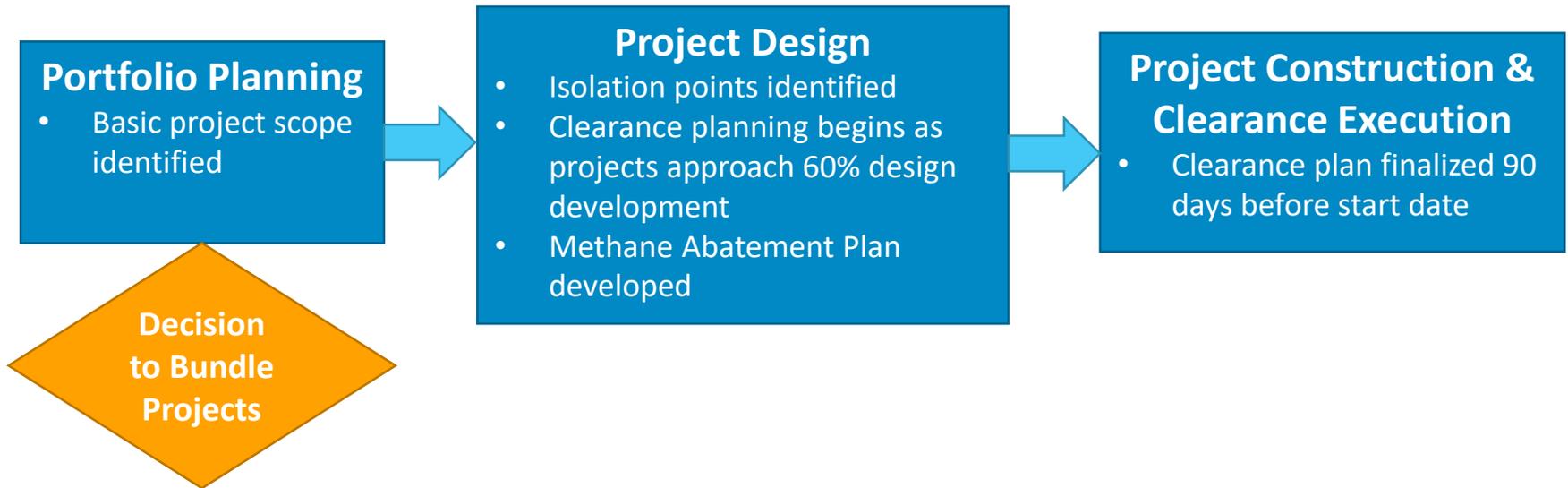


Simplified Project Timeline

Year 1
○

Year 2
○

Year 3
○

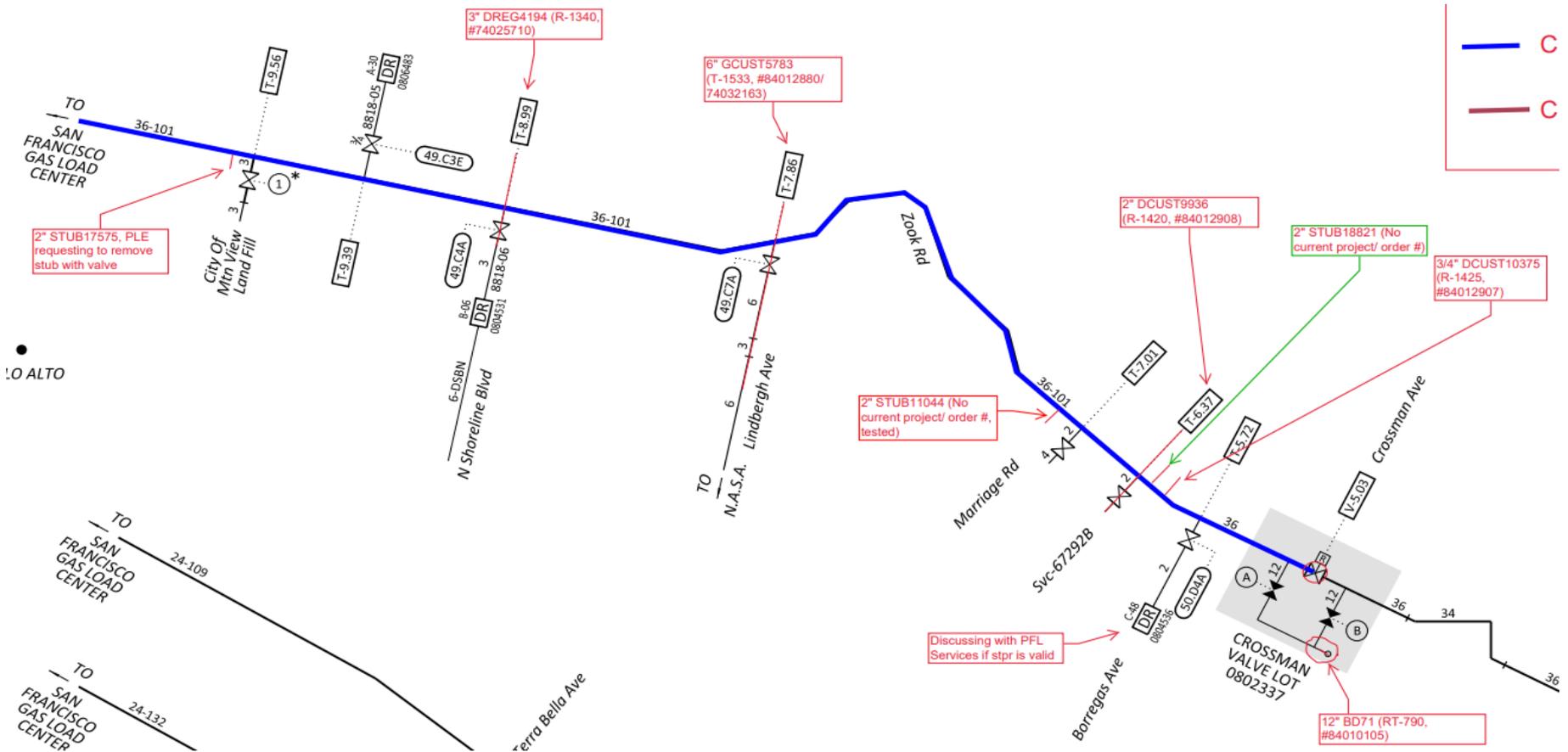


★ **Need a simple method to estimate natural gas abated from clearance bundling while maintaining schedule and system planning efficiencies from bundling**



Example: Project Bundle (PB)-146

WCD #	Short Description	Final Authorization Date	Complete Date	Gas Blown Down (mscf)
80126687	DA-L-101-Crossman-Rengstorff-No Draft	9/23/2020	9/28/2020	7934





Example: Project Bundle (PB)-146

Project #	Short Description
R-1340	R-1340 DREG4194 MP 0.00 Replace Pipe & Valve PB-146
R-1425	R-1425 DCUST10375 MP 0.00 Remove 3/4" Stub PB-146
R-1420	R-1420 DCUST9936 MP 0.00-0.01 Replace 40' 2" Pipe PB-146
V-804	V-804 L-101 MP 9.56 Remove V-1 & V-2 PB-146
*T-1533	T-1533 GCUST5783 MP 0.00-0.10 Test 572'
*STUB 11821	Stub removal
*STUB 11044	Stub removal
*STUB 17575	Stub removal



Methodology & Assumptions

- Pressure is constant along the impacted area of the transmission line before the blowdown
- Pipe diameter is constant along the cleared transmission line
- The actual gas released was evenly distributed along the length of the cleared pipe
- If other methane reduction strategies (e.g. drafting, cross compression) were executed in the bundle, it was assumed these strategies would also have been performed had the clearances been executed separately.



Terminology & Equations

The proposed **Bundling Reduction Factor (BRF)** and **actual amount of Gas Released (A)** can be used to estimate the **Gas Abated** from bundling projects/clearances together:

$$\text{Gas Abated} = A * \left(\frac{1}{1 - \text{BRF}} - 1 \right)$$

Bundling Reduction Factor (BRF) [%] = 50% for bundles with 2 projects & 67% for bundles with 3 or more projects



Findings of 2019 Project Bundling Analysis

Number of Projects per Clearance	Number of Clearances with X Projects Bundled	Hypothetical Gas Released [mscf] (H)	Actual Gas Released [mscf] (A)	Estimated Gas Abated [mscf] (H-A)	Calculated BRF [(H-A)/H]	Bundling Reduction Factor
2 Projects	12	42076.3	21038.2	21038.2	0.50	0.50
3 Projects	10	59512.2	19837.4	39674.8	0.67	0.67
4 Projects	1	29932.6	8843	21089.6	0.70	0.67
5 Projects	1	7262.7	3470.3	3792.3	0.52	0.67
7 Projects	1	42906.6	5668.2	37238.4	0.87	0.67
8 Projects	1	2361.3	774.5	1586.9	0.67	0.67
Total	26	184052	59632	124420	0.68	-

- Use **BRF** = 0.50 for clearances with 2 projects bundled together
- Use **BRF** = 0.67 for clearances with 3 or more projects bundled together



2020 GHG Reduction by Bundle

Pre-Planned Project Bundles	24
Pre-Planned Projects in Bundled Clearances	51
Executed Bundled Clearances	28
Projects in Executed Bundled Clearances	60

- Not all project bundles result in clearances with GHG reductions
- Project Bundling is driven by geographic location, scheduling & construction cost savings



2020 Project Bundle Results

Number of Projects per Clearance	Number of Clearances with X Projects Bundled	Actual Gas Released [mscf] (A)	Bundling Reduction Factor	Estimated Gas Abated [mscf] (H-A)
2 Projects	13	9404	0.50	9404
3 Projects	5	6180	0.67	12364
4 Projects	7	80278	0.67	160556
5 Projects	N/A	N/A	0.67	N/A
7 Projects	N/A	N/A	0.67	N/A
8 Projects	3	9630	0.67	19261
Total	28	105493	-	201585

- Overall, 66% gas abated from bundling clearances
- Continue applying 50% and 67% BRF until we have additional data to analyze



Thank You

Ken Rogers, Principal Program Manager

KER1@pge.com

L. Isaac Marcia, Associate Gas Engineer

LIM2@pge.com

Francois-Xavier Rongere, Manager of R&D and Innovation

FxRg@pge.com

Stephen Ramos, Expert Gas Engineer

S3RC@pge.com

